User Manual

EDK 400J EnOcean Developer Kit

Important Notes

This information describes the type of component and shall not be considered as assured characteristics. No responsibility is assumed for possible omissions or inaccuracies. Circuitry and specifications are subject to change without notice. For the latest product specifications, refer to the EnOcean website: http://www.enocean.com.
As far as patents or other rights of third parties are concerned, liability is only assumed for modules, not for the described applications, processes and circuits. EnOcean does not assume responsibility for use of modules described and limits its liability to the replacement of modules determined to be defective due to workmanship. Devices or systems containing RF components must meet the essential requirements of the local legal authorities. The modules must not be used in any relation with equipment that supports, directly or indirectly, human health or life or with applications that can result in danger for people, animals or real value. Components of the modules are considered and should be disposed of as hazardous waste. Local government regulations are to be observed.
Packing: Please use the recycling operators known to you. By agreement we will take packing material back if it is sorted. You must bear the costs of transport. For packing material that is returned to us unsorted or that we are not obliged to accept, we shall have to invoice you for any costs incurred.

This development kit and its components are intended for use for evaluation, demonstration or engineering development purposes only. It is not considered to be a finished end product fit for consumer use. Persons handling this developer kit must have electronics expertise and observe good engineering practice standards. As such, the goods being provided are not intended to be complete in terms of required design, marketing, and/or manufacturing related protective considerations, including product safety and environmental measures typically found in end products that incorporate such electronic components or circuit board. EnOcean does not reliable consequences for any HW or SW changes/modifications of the developer board done by the developer.

Important notice for users in Japan: This developer kit is not certified as confirming to technical regulations of radio law of Japan. If you use this kit in Japan, you are required by Radio Law of Japan to follow the instructions below with respect to this product: Use this product in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on sub-section 1.1 of article 6 of the "Rule for Enforcement of Radio Law of Japan". Use this kit only after you obtained the license of "Test Radio Station" as provided in Radio Law of Japan with respect to this product, or use of this product only after you obtained the technical regulations conformity certification as provided in radio law of Japan with respect to this product. Do not transfer this product, unless you give the same notice above to the transferee. Please note that if you could not follow the instructions above, you will be subject to penalties of Radio Law of Japan.

Observe precautions! Electrostatic sensitive devices!

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1 Introduction

EDK 400 contains everything you need to start implementing innovative solutions with EnOcean's energy harvesting and ultra-low power radio technologies. The kit will help you to demonstrate and configure EnOcean products. Additionally you can easily design new hardware and start software programming. For details of components please download corresponding user manuals from EnOcean.

Content

- User Manual
- USB cable (A plug - mini B plug)
- USB 400J: USB Stick Gateway
- PTM 210J: Push button switch
- STM 43xJ: Self-powered temp. sensor
- ECO 200: Mechanical energy harvester incl. housing example
- PTM 430J: Push button radio module incl. test rocker example
- STM 400J: Radio sensor module on adapter board
- EOP 350: Universal programmer board

Updates for this user manual are available at:
http://www.enocean.com/en/enocean_modules/edk-400J/

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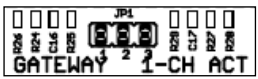
2 First Steps and Demonstrations

2.1 Demonstration of '1-Channel Relay Switch' and 'Learn-Concept'

The TCM 400J module with standard software has already several pre-implemented features for building automation. The 1-channel relay mode is used to switch on and off a module pin. If you connect a relay to this pin you can switch a line-powered device.

1. Plug TCM 400J into EOP 350 and set jumper to 1-CH ACT



2. Connect EOP 350 with USB power (e.g. PC)

3. Learn PTM switch ID to TCM 400J:

- Press LEARN button on EOP 350 > 0.5s

  ➔ LMI LED will light, CH0 will flash

- Push switch rocker one time to send learn telegram
- Finish learn mode with LEARN button > 0.5s

4. Push PTM switch to toggle CH0 LED (relay pin)

Attention:

- Example works only with TCM 400J standard firmware and rocker on PTM switch.
- If you have replaced TCM firmware, load TCM default firmware from website.
- Pushing the switch a second time during learn mode will delete the ID.
- Operating mode can only be changed after deleting all IDs.
- During learn mode, supply voltage needs to be stable to avoid flash corruption.

2.2 Software Installation

- Please register your personal account on the EnOcean website:
  http://www.enocean.com/en/download/

Following software components need to be downloaded and installed:

DolphinView

- Visualize properties of EnOcean radio nodes
- Receives, sends and analyses radio telegrams according to the EnOcean standard
- Get detailed information e.g. sub-telegram timing and signal strength
- Content of telegrams can be analyzed online and logged with time stamp
- Supports remote management features like ping, query and remote learn

DolphinSuite (successor of DolphinStudio)

- DolphinSuite software provides a graphical user interface allowing easy configuration and programming of EnOcean modules with Dolphin chip V4.

DolphinAPI

- Operating system for self-powered applications
- Source code samples in C-Code for switching, dimming etc.
- Comprehensive software libraries (wireless communication, energy management, …)

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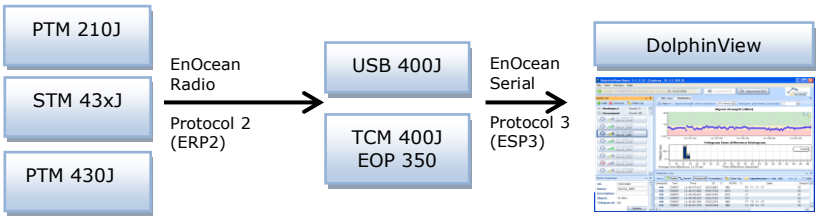
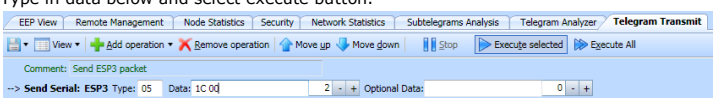
2.3 DolphinView Advanced

- EnOcean DolphinView visualizes and interprets EnOcean radio telegrams.
  It receives EnOcean telegrams via USB 400 or TCM 400 (with DolphinSniffer SW).



- Download DolphinView from EnOcean's Software download website
- Execute the DolphinView setup program
- Connect USB 400J or TCM 400J to your PC or notebook
- Execute DolphinView
  - Select COM port with GatewayController of DolphinSniffer
  - Press connect button
  - Change from ERP1 to ERP2 via ESP2 command: CO_WR_MODE.
    Type in data below and select execute button.

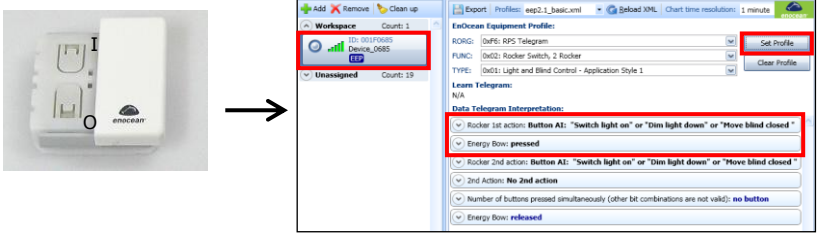


  - Node List will show radio nodes sending EnOcean telegrams
  - More details about telegrams are available in telegram view and log window,
  - For details see DolphinView Help

2.4 Demonstration of PTM 210J

The push-button radio transmitter module enables the implementation of wireless remote controls without batteries. Key applications are wall-mounted rocker switches or handheld remote controls.

- Radio telegrams will be received via USB 400J and shown by DolphinView
- Press rocker to send switch telegram ➔ PTM switch will be shown in node list
- Double click on PTM within the node list ➔ PTM will be added to the node list
- Select node and press "Set Profile" button to interpret Equipment Profile*)
- Press rocker on I-side (marking on PTM switch) to send "switch on telegram"
- Press rocker on O-side (marking on PTM switch) to send "switch off telegram"



*) PTM 210J uses EnOcean radio protocol 2 (ERP2). The EnOcean Equipment Profile (EEP) of PTM devices has been optimized for this protocol. For details see PTM 210J user manual.

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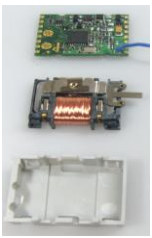
3 Assembling of an Industrial Switch

Just combine the plastic frame switch with mechanical energy harvester ECO 200 and radio electronic board PTM 430J and you have assembled your first self-powered switch. This demonstrates how EnOcean's energy harvesting and ultra-low power radio technology can be implemented within various environments.

1. Place ECO 200 generator into plastic frame

2. Clip PTM 430J electronic board on top

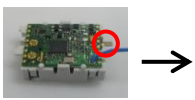


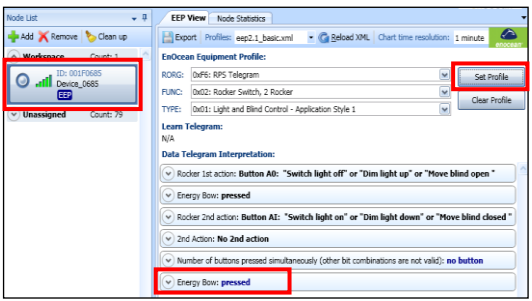
3. Press the spring on the ECO 200 and it will send multiple EnOcean telegrams

3.1 ECO 200 & PTM 430J – Push Button Generator & Radio Module

ECO 200 is an energy converter for linear motion. It can be used to power the PTM 430J radio module. The energy output at every actuation is sufficient to transmit several sub-telegrams. Possible applications are miniaturized switches and sensors in building technology and industrial automation.

- Radio telegrams will be received via USB 400J and shown DolphinView
- Press spring to send telegram ➔ PTM 430J will be shown in the node list
- Select node and press "Set Profile" button to interpret EnOcean Equipment Profile*)
- Press spring to send telegram "Energy Bow: pressed"
- Pull spring to send telegram "Energy Bow: release"





*) PTM 210J uses EnOcean radio protocol 2 (ERP2). The EnOcean Equipment Profile (EEP) of PTM devices has been optimized for this protocol. In order to simulate a wall switch (PTM 210J), you need to use the contact pins on top of the board. For details see PTM 430J user manual.

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4 Working with DolphinSuite

DolphinSuite is used for configuration and programming of EnOcean modules with Dolphin chip V4. It is the successor of DolphinStudio used for Dolphin V1.3 based modules. DolphinSuite consists of following software components:

- DolphinProgrammer
- DolphinAPIConfigurator
- DolphinModuleConfigurator
- DolphinCalibration (optional)

4.1 DolphinSuite Installation

1. Download DolphinSuite from http://www.enocean.com/en/download/

2. Install DolphinSuite via setup program

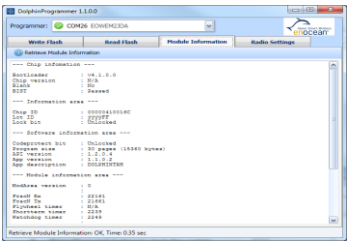
3. Unplug jumper on STM 43xJ and keep it for later usage

4. Plug STM 43xJ temperature sensor on top of EOP 350 (antenna to the left side)

5. Connect EOP 350 via USB cable to PC

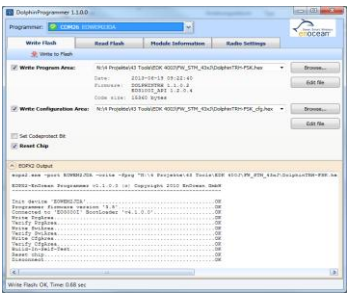
4.2 Check and Update Firmware with DolphinProgrammer

Check Firmware Version:



1. Start DolphinProgrammer and select "Module Information" tab
2. Press "Retrieve Module Information " button
3. Current application type and version will be shown

Update Firmware:



1. Program and compile your own FW or download FW from EnOcean website
2. Start DolphinProgrammer and select "Write Flash" tab
3. Select FW file via "Browse…" button; chip configuration file will be automatically recognized by ending *cfg.hex
4. Press "Write to Flash" button to start the update process
5. Firmware update was successful when all reported actions are ok

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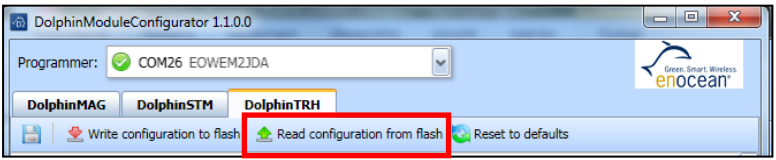
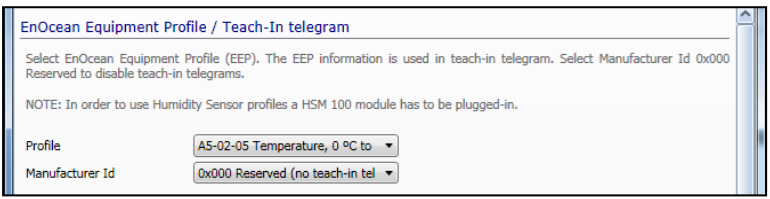
4.3 Configuration of Temperature Sensor STM 43xJ

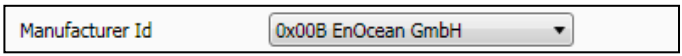
1. Start DolphinModuleConfigurator
2. Select "DolphinTRH" tab
3. Click on "Read configuration from flash" butto



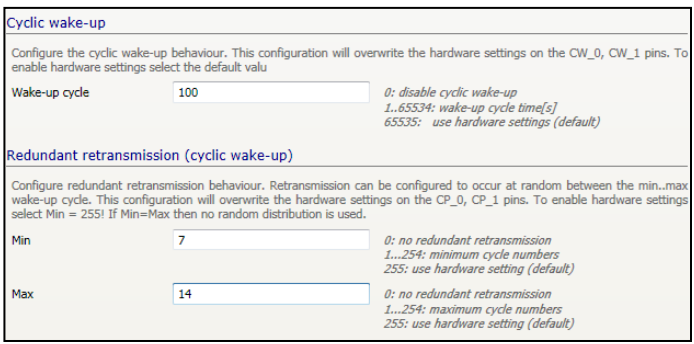
4. You will get on overview of the temperature sensor default configuration


EnOcean Equipment Profile / Teach-In telegram
Select EnOcean Equipment Profile (EEP). The EEP information is used in teach-in telegram. Select Manufacturer Id 0x000 Reserved to disable teach-in telegrams.
NOTE: In order to use Humidity Sensor profiles a HSM 100 module has to be plugged-in.
Profile
A5-02-05 Temperature, 0 °C to
Manufacturer Id
0x000 Reserved (no teach-in tel

5. STM 43xJ will only send a LEARN telegram if an "Manufacturer ID" is configured. Change "Manufacturer ID" for example to EnOcean GmbH and press "Write configuration to Flash" button.



6. You can change the wake up cycle. Keep in mind, this will heavily affect the energy budget. For details see STM user manual.


Cyclic wake-up
Configure the cyclic wake-up behaviour. This configuration will overwrite the hardware settings on the CW_0, CW_1 pins. To enable hardware settings select the default valu
Wake-up cycle
100
0: disable cyclic wake-up
1..65534: wake-up cycle time[s]
65535: use hardware settings (default)
Redundant retransmission (cyclic wake-up)
Configure redundant retransmission behaviour. Retransmission can be configured to occur at random between the min..max wake-up cycle. This configuration will overwrite the hardware settings on the CP_0, CP_1 pins. To enable hardware settings select Min = 255! If Min=Max then no random distribution is used.
Min
7
0: no redundant retransmission
1...254: minimum cycle numbers
255: use hardware setting (default)
Max
14
0: no redundant retransmission
1...254: maximum cycle numbers
255: use hardware setting (default)

Typical values for OEM products are:

Cyclic wake-up cycle:	100s	(wake up and check temperature value)
Redundant retransmission min:	7	(min send interval every 7. wake up)
Redundant retransmission mx:	14	(max send interval every 14. wake up)

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7. Unplug STM 43xJ from EOP 350 and set jumper as before (near learn button)

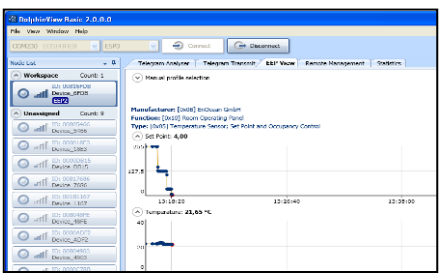
8. Start DolphinView Advanced

9. Connect to USB 400J or TCM 400J to PC

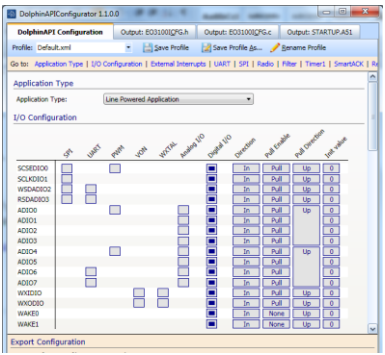
10. Press learn button on STM 43xJ
➔ Learn telegram will be sent, and DolphinView will automatically recognize the temperature sensor (see EEP symbole in node list)

11. Select "EEP View" and wait for the first telegram send by the sensor after the retransmission interval

➔ Sensor values will be automatical interpreted and plotted into a diagram



5 Write your own Firmware



1. Download DolphinAPI and install from http://www.enocean.com/en/download/

2. Get your IDE (Keil µVision) and C51 development tool (PK51) from ARM http://www.keil.com/c51/pk51kit.asp

3. With DolphinAPIConfigurator you can adapt Dolphin chip configurations to you need.

4. A description and C-code samples can be found within the installation folder of DolphinAPI

5. Implement your application and upload the firmware via DolphinProgrammer

If you have any questions, please look at our knowledge base or contact application engineering:

http://www.enocean.com/en/knowledge-base/
support@enocean.com

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6 References

User Manuals of EnOcean 928MHz modules are available for download at: http://www.enocean.com/en/enocean_modules_928mhz/

Software can be found at: *www.enocean.com/download*

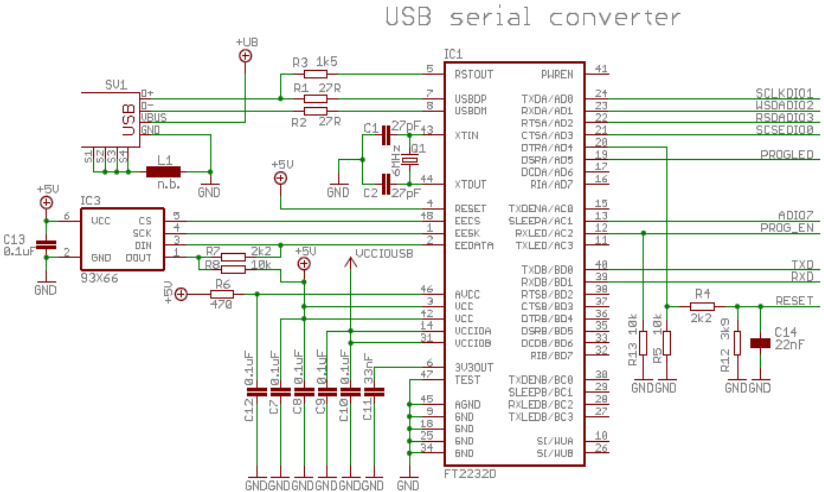
Additional information: *http://www.enocean.com/knowledge-base/*

Technical support: *support@enocean.com*

EnOcean Alliance application layer (EnOcean Equipment Profiles): *http://www.enocean-alliance.org/en/home/*

EnOcean security specification: *www.enocean.com/en/security-specification/*

7 EOP 350-2 Circuit & Layout



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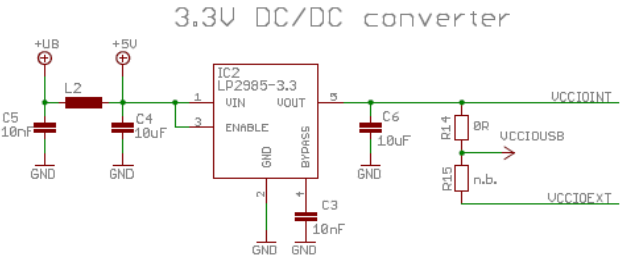
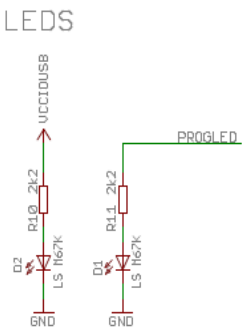
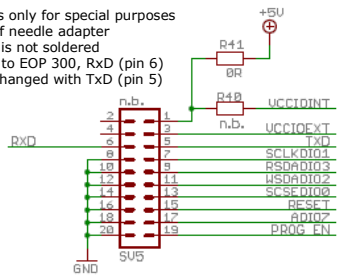
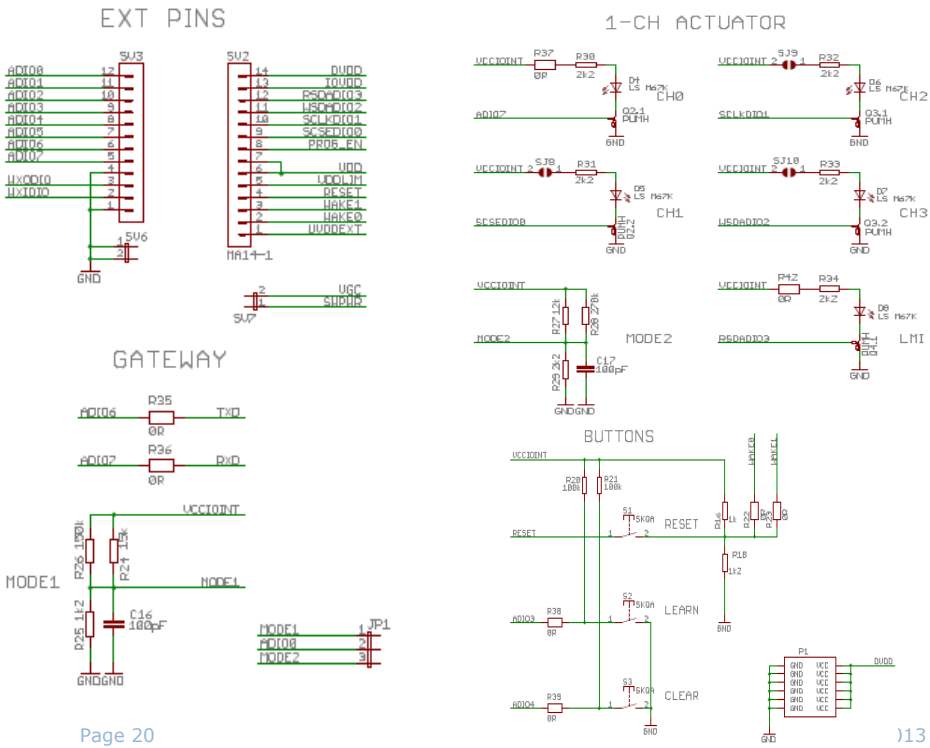


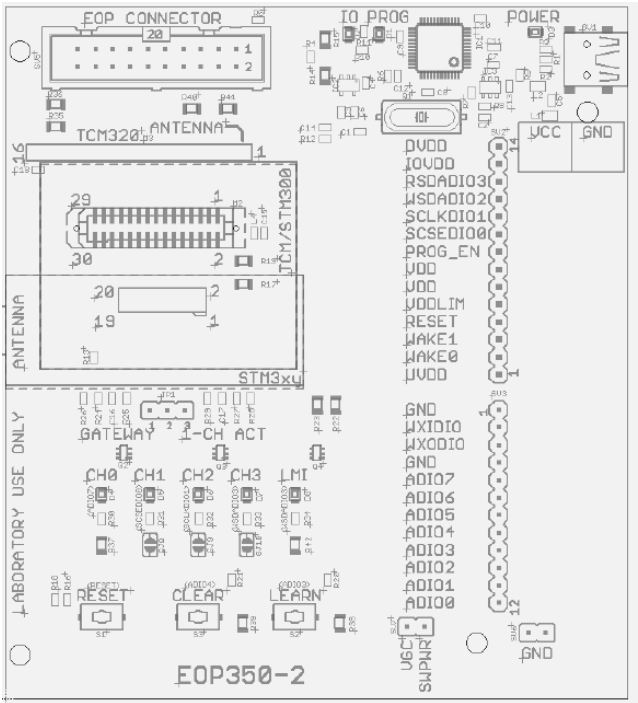


Programmer interface

Remarks:
- Interface is only for special purposes e.g. bed of needle adapter
- Connector is not soldered
- Compared to EOP 300, RxD (pin 6) has been changed with TxD (pin 5)




EXT PINS
SV3
SV2
ADIO0
ADIO1
ADIO2
ADIO3
ADIO4
ADIO5
ADIO6
ADIO7
UXCDIO
UXIDIO
SV6
GND
MA14-1
DVDD
IOVDD
PSDADIO3
WSDADIO2
SCLKDIO1
SCSEDIO0
PROG_EN
VDD
VCCIOINT
RESET
WAKE1
WAKE0
UVDDEXT
SV7
VCC
SVDUB
1-CH ACTUATOR
CH0
CH1
CH2
CH3
MODE2
LMI
GATEWAY
R35
0R
TXD
R36
RXD
MODE1
R26 100k
R24 15k
R25 1k2
C16
100pF
GNDGND
JP1
BUTTONS
R20 100k
R21 10k
S1
5KQA
RESET
S2
LEARN
S3
CLEAR
P1
DVDD


EOP CONNECTOR
IO PROG
POWER
ANTENNA
TCM320
TCM/STM300
STM3xU
ANTENNA
GATEWAY
1-CH ACT
CH0
CH1
CH2
CH3
LMI
RESET
CLEAR
LEARN
LABORATORY USE ONLY
EOP350-2
DVDD
IOVDD
RSDADIO3
WSDADIO2
SCLKDIO1
SCSEDIO0
PROG_EN
VDD
VDD
VDDLIM
RESET
WAKE1
WAKE0
UVDD
GND
XIDIO
XODIO
GND
ADIO7
ADIO6
ADIO5
ADIO4
ADIO3
ADIO2
ADIO1
ADIO0
VCC
GND
SWPWR
GND

ENOCEAN

EnOcean is the originator of patented energy harvesting wireless sensor technology. The company manufactures and markets maintenance-free wireless sensor solutions for use in buildings and industrial installations. EnOcean solutions are based on miniaturized energy converters, ultra-lowpower electronic circuitry and reliable wireless. Combining these elements enables EnOcean and its product partners to offer sensor systems that are fundamental for energy-efficient buildings and innovative industry.

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